Precalc Warm Up # 12-1

Check in with your group to make sure you all agree on the answer and the best method!

Solve:

1. $x^2 - 4x = 5$

2. $2^x = 32$

3. $8^{x+3} = \dfrac{1}{2^{4x-6}}$

EXERCISES 7.1.1

p. 200

1. Simplify the following

(a) $\left(\dfrac{3y^2}{4x^3}\right)^3 \times (2x^2y^3)^3$

(d) $\left(\dfrac{2x^3}{3y^2}\right)^3 \times (xy^2)^2$

(g) $\dfrac{4^{n+2} - 16}{4}$

$\dfrac{4^n \cdot 4^2 - 4^2}{4}$

$\dfrac{4^2(4^n - 1)}{4}$

$4^1(4^n - 1)$

$4^{n+1} - 4$

2. Simplify the following

(a) $\frac{20^6}{10^6}$

(d) $\frac{(ab)^{2x}}{a^{2x}b^{4x}}$

3. Simplify the following

(a) $\left(\frac{x}{y}\right)^3 \times \left(\frac{y}{z}\right)^2 \times \left(\frac{z}{x}\right)^4$

(d) $\frac{9^n \times 3^{n+2}}{27^n}$

(g) $\frac{x^{4n+1}}{(x^{n+1})(n-1)}$

$$\frac{x^{4n} \cdot x^1}{x^{n^2-1}}$$

$$\frac{x^{4n} \cdot x^1}{x^{n^2} \cdot x^{-1}}$$

$$x^{4n-x^2} \cdot x^{1-(-1)}$$

$$x^2 \cdot x^{4n-x^2}$$

$$x^{(-x^2+4n+2)}$$

2. Simplify the following

(a) $\frac{20^6}{10^6}$

(d) $\frac{(ab)^{2x}}{a^{2x}b^{4x}}$

3. Simplify the following

(a) $\left(\frac{x}{y}\right)^3 \times \left(\frac{y}{z}\right)^2 \times \left(\frac{z}{x}\right)^4$

(d) $\frac{9^n \times 3^{n+2}}{27^n}$

(g) $\frac{x^{4n+1}}{(x^{n+1})(n-1)}$

$$\frac{3^{2n} \cdot 3^n \cdot 3^2}{3^{3n}}$$

$$\frac{3^{3n} \cdot 3^2}{3^{3n}}$$

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$$\frac{x^{4n} \cdot x^1}{x^{n^2-1}}$$

$$\frac{x^{4n} \cdot x^1}{x^{n^2} \cdot x^{-1}}$$

$$\frac{x^{4n} \cdot x^2}{x^{n^2}}$$

$$x^{4n+2-n^2}$$

4. Simplify $\dfrac{(x^m)^n(y^2)^m}{(x^m)^{(n+1)}y^2}$.

$= \dfrac{x^{mn} \cdot y^{2m}}{x^{mn+m} \cdot y^2}$

$= \dfrac{x^{mn}}{x^{mn} \cdot x^m} \cdot \dfrac{y^{2m}}{y^2} = \dfrac{y^{2m-2}}{x^m}$

5. Simplify the following, leaving your answer in positive power form

(a) $\dfrac{(-3^4) \times 3^{-2}}{(-3)^{-2}}$

$\dfrac{-1 \cdot 3^4 \cdot (-3)^2}{(3)^2}$

-81

(d) $\dfrac{x^{-2} + 2x^{-1}}{x^{-1} + x^{-2}}$

$\dfrac{\left(\frac{1}{x^2} + \frac{2}{x}\right)}{\left(\frac{1}{x} + \frac{1}{x^2}\right)} \cdot \dfrac{\frac{x^2}{1}}{\frac{x^2}{1}}$

$\dfrac{1 + 2x}{x + 1}$

6. Simplify the following

(a) $\dfrac{(x^{-1})^2 + (y^2)^{-1}}{x^2 + y^2}$

$\dfrac{x^{-2} + y^{-2}}{x^2 + y^2}$

$\dfrac{\frac{y^2}{y^2} \cdot \frac{1}{x^2} + \frac{1}{y^2} \cdot \frac{x^2}{x^2}}{\frac{x^2 + y^2}{1}}$

$\dfrac{\frac{y^2 + x^2}{x^2 y^2}}{\frac{x^2 + y^2}{1}} \cdot \dfrac{1}{(x^2 + y^2)}$

$\dfrac{1}{x^2 y^2}$

(d) $(x^2 - 1)^{-1} \times (x + 1)$

7. Simplify the following

(a) $5^{n+1} - 5^{n-1} - 2 \times 5^{n-2}$

$5^n \cdot 5^1 - 5^n \cdot 5^{-1} - 2 \cdot 5^n \cdot 5^{-2}$

$5^n\left(5 - \frac{1}{5} - \frac{2}{25}\right)$

$5^n\left(\frac{125}{25} - \frac{5}{25} - \frac{2}{25}\right)$

$\frac{118}{5^2} \cdot 5^n$

$118(5)^{n-2}$

(d) $\left(\frac{a^{m+n}}{a^n}\right)^m \times \left(\frac{a^{n-m}}{a^n}\right)^{m-n}$

$\left(\frac{a^m \cdot a^{mn}}{a^n}\right)^m \left(\frac{a^n \cdot a^{-m}}{a^n}\right)^{m-n}$

$a^{m^2} \cdot (a^{-m})^{m-n}$

$a^{m^2} \cdot a^{-m^2+mn}$

$\boxed{a^{mn}}$

(g) $\frac{2^{n+4} - 2(2^n)}{2(2^{n+3})}$

$= \frac{2^n \cdot 2^4 - 2^1 \cdot 2^n}{2^1 \cdot 2^n \cdot 2^3}$

$= \frac{2^1 \cdot 2^n (2^3 - 1)}{2^1 \cdot 2^n \cdot 2^3}$

$\boxed{\frac{7}{8}}$

SL 7.1 Solving equations with the variable in the exponent.

Advice: If possible, write with a common base.

Examples:

1. $3^x + 1 = 82$

$-1 \quad -1$

$3^x = 81$

$3^x = 3^4$

$x = 4$

2. $8^x = \frac{1}{32}$

$2^{3x} = 2^{-5}$

$3x = -5$

$x = \frac{-5}{3}$

3. $\{x \mid 3^{x+1} = 3\sqrt{3}\}$

$3^{x+1} = 3^1 \cdot 3^{1/2}$

$3^{x+1} = 3^{(1+\frac{1}{2})}$

$x + 1 = \frac{3}{2}$

$\boxed{x = \frac{1}{2}}$

4. $\{x \mid 3^{x^2-5x+2} = 9^{x+1}\}$

$3^{x^2-5x+2} = (3^2)^{x+1}$

$x^2 - 5x + 2 = 2x + 2$

$x^2 - 7x = 0$

$x(x-7) = 0$

$x = 0, 7$

5. $\{x \mid 6^{x^2+3x-10} = 1\}$

6^0

$x^2 + 3x - 10 = 0$

$(x+5)(x-2) = 0$

$x = -5, 2$

$(x^2 + x - 5)^x = x^2 + x - 5$ Hint: there are 4 solutions!

Try to think of all possibilities:

- something^1 = itself
- anything^0 = 1
- 1$^{\text{anything}}$ = 1
- 0^0 is undefined
- 1$^{\text{anything}}$ = 1$^{\text{anything else}}$
- 0$^{\text{anything above 0}}$ = 0
- $(-1)^{\text{even}} = 1$
- $0^{\text{anything positive}} = 0^{\text{anything else positive}}$
- $(-1)^{\text{even}} = (-1)^{\text{even}}$
- $(-1)^{\text{odd}} = (-1)^{\text{odd}}$

$(x^2 + x - 5)^x = x^2 + x - 5$ Hint: there are 4 solutions!

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- $(-1)^{\text{odd}} = (-1)^{\text{odd}}$

Groups: find as many solutions as you can!

$(x^2 + x - 5)^x = x^2 + x - 5$

something^1 = itself $x = 1$

1$^{\text{anything}}$ = 1 $x^2 + x - 5 = 1$

$x^2 + x - 6 = 0$

$(x+3)(x-2) = 0$

$x = -3, 2$

0$^{\text{anything above 0}}$ = 0 $x^2 + x - 5 = 0$

$x = \frac{-1 \pm \sqrt{1-4(-5)}}{2}$

$x = -\frac{1}{2} \pm \frac{\sqrt{21}}{2}$

$x = -\frac{1}{2} + \frac{\sqrt{21}}{2}$

Does $(-1)^{\text{odd}} = -1$ work?

$x^2 + x - 5 = -1$

$x^2 + x - 4 = 0$

$x = \frac{-1 \pm \sqrt{1-4(-4)}}{2}$

$x = \frac{-1 \pm \sqrt{17}}{2}$

$(-1)^{\left(\frac{-1 \pm \sqrt{17}}{2}\right)} \stackrel{?}{=} -1$

$\left((-1)^{\frac{1}{2}}\right)^{(-1 \pm \sqrt{17})}$

HW: SL book p. 203 #1 b,e,h #2b,e,h

p. 204 #1 b,e,h #2b,e

and all of 3

answer: $\frac{5}{4}$

p. 204

On 3a, they left off the answer: $\frac{1 \pm \sqrt{5}}{2}$

and on 3e, they left off: $\frac{-1 + \sqrt{229}}{2}$